

Sheet 4

immediate

5

ADD # Num, R_i

(a)

Suppose your instruction is two word so your operand in 2nd word

1 - PC_{out}, MAR_{in}, Read, Select u, add
Z_{in}

2 - Z_{out}, PC_{in}, Y_{in}, WMFC

3 - MDR_{out}, IR_{in}

4 - PC_{out}, MAR_{in}, Read, Select u, Add, Z_{in}

5 - Z_{out}, PC_{in}, Y_{in}

6 - R_{out}, Y_{in}, WMFC

7 - MDR_{out}, Select u, Add, Z_{in}

8 - Z_{out}, R_{in}, End.

③ ADD num, R_i ^{Absolute}

④

⑤ Z_{out}, R_{cin}, Y_m, WMFC

⑥ MDR_{out}, MAR_{in}, Read

⑦ R_{iout}, Y_m, WMFC

⑧ MDR_{out}, select y, Add, Z_{in}

⑨ Z_{out}, R_{iin}, End.
ADD (num), R_i
 ^{indirect}

④

①

⑩ MDR_{out}, MAR_{in}, Read, WMFC

⑪ MDR_{out}, MAR_{in}, Read

8, 9, 10 → 7, 8, 9

⑫ sec 9

a Program for A, B, C

1 → u

5 - Z_{out} , P_{Cn} , y_n if Imm branch to 1.

6 - WMFC

7 - MDR_{out}, MAR_{in}, Read, if Abs branch;

8 - WMFC

9 - MDR_{out}, MAR_{in}, Read.

10 - 7 → 9

3

Sec 9

$$\boxed{7} \quad \frac{28}{42} = 67\%$$

2ns

| | | | |
|----|---|--------|--------------------------|
| 1- | — | | |
| 2- | — | , WMFC | memory 16ns CPU ← 2ns |
| 3- | — | | 2ns |
| 4- | — | , WMFC | 16 ns |
| 5- | — | | 2 ns |
| 6- | — | | 2 ns |
| 7- | — | | |

How long does memory take as percent of overall time of CPU instruction exec.

4 sec i.

sheet 5

- Single bus CPU

1 - PC_{out} , MAR_{in} , Read, Select 4, Add, Z ,

2 - Z_{out} , PC_{in} , y_{in} , write

3 - MDR_{out} , IR_{in} .

4 - (offset field of IR) $_{out}$, Add, if $N=1$
then PC_{in} , End

- multi bus CPU ← new في

1 - PC_{out} , $R=B$, MAR_{in} , Read, Inc PC

2 - WNPC

3 - MDR_{out} , $R=B$, IR_{in}

4 - PC_{out} , (offset field of IR) $_{out}$,
Add, if $N=1$, then PC_{in} , End.

5

Sec 9